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Atomistic study of a nanometer-scale pump based on the thermal ratchet concept¹ ELTON OYARZUA, University of Concepcion, J. H. WALTHER, Technical University of Denmark, HARVEY ZAMBRANO, University of Concepcion — In this study, a novel concept of nanoscale pump fabricated using Carbon Nanotubes (CNTs) is presented. The development of nanofluidic systems provides unprecedented possibilities for the control of biology and chemistry at the molecular level with potential applications in low energy cost devices, novel medical tools, and a new generation of sensors. CNTs offer a number of attractive features for the fabrication of fluidic nanodevices including fast flow, useful electronic and thermal properties, high mechanical strength and biocompatibility. Therefore, the transport of liquids in CNTs is now of great interest in nanofluidics. Thermophoresis is the phenomenon observed when a mixture of two or more types of motile objects experience a force induced by a thermal gradient and the different types of objects respond to it differently, inducing a motion and segregation of the objects. Using molecular dynamics simulations, we explore the possibility to design thermophoretic pumping devices fabricated of CNTs for water transport in nanoconduits. The design of the nanopumps is based on the concept of the Feynman-Smoluchowski ratchet.

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